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membership in the American Society of Zoologists. This is true and is one of the strongest reasons for the existence of Section F as an organization independent of the American Society of Zoologists. However, so far as experience at meetings in recent years goes, this large membership of Section F has no important bearing on the question of a consolidated program of papers under the auspices of the American Society of Zoologists. There have probably not been a half dozen papers read before Section F in the past three years by authors who were not also members of the American Society of Zoologists or who could not have obtained an introduction to that society for the reading of their papers. Moreover, the sectional committee of Section F has constitutional authority for rejecting papers not satisfactory in preliminary abstracts; and since the members of that committee are also members of the American Society of Zoologists there is no reason to suppose that an irresponsible member of Section F could get an opportunity to read a paper in a consolidated program with the American Society of Zoologists.

A second objection is that the large audiences composed of members of Section F inhibits discussion and as a result zoological meetings are not so helpful as they were years ago. This is absurd to one who observed the record-breaking run of papers made by the American Society of Zoologists at Baltimore on the days when Section F held its own meetings. It is evident that the American Society of Zoologists has already overgrown in scope, in membership and in productivity of members; and soon must consider some natural subdivision in order to gain the time for the deliberate work which was once so satisfactory.

It is true, as charged by certain members of the American Society of Zoologists, that the majority of papers read before Section F are by the younger group of zoologists. But may not these men just entering the zoological field have some right to the inspiration and criticism derivable from reading papers before a body of older zoologists? Have those who object to the reading of papers by the younger

men forgotten that ten or twenty years ago they too were just emerging from the graduate schools and were eager to present their research work? The need of an opportunity for those not yet eligible to membership in the American Society of Zoologists is alone sufficient justification for regular programs of Section F whenever the American Society of Zoologists does not adopt some such grouping of papers and parallel sectional meetings as will permit the reading of all zoological papers worthy of serious consideration. If the officers of the American Society of Zoologists are willing to make such an arrangement, the present officers of Section F will cooperate fully in the selection of papers offered by members of Section F who are not also members of the American Society of Zoologists, and after that will leave the programs for reading of papers entirely under the auspices of the officers of the American Society of Zoologists. But if such a consolidation is not acceptable to the American Society of Zoologists, the officers of Section F will continue to consider it their duty to arrange otherwise for the reading of worthy papers by men who do not have an opportunity to present results of their research before the American Society of Zoologists.

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#### THE BIRTHPLACES OF LEADING AMERICANS AND THE QUESTION OF HEREDITY

IN SCIENCE, April 9, I challenged the following statement of Mr. W. J. Spillman:

With only 29 per cent. of our population actually living on the farm, with miserably poor school facilities as compared with our city population, this 29 per cent. furnishes about 70 per cent. of the leaders in every phase of activity in this country.

IN SCIENCE, May 7, Mr. Spillman corrects his 29 per cent. to about 36 per cent. He admits that he has "no way of ascertaining how many of the men who are distinctly leaders in this country were actually brought up

on the farm." He also says he merely repeated a statement he had heard frequently and which he had never heard challenged.

Mr. Spillman, however, doubts the significance of the facts which I presented in *SCIENCE*, April 9, drawn from "Who's Who in America" showing that centers of population of 8,000 and over have produced about twice their expected ratio of persons included in this volume. I do not myself claim that these figures give a final refutation to the belief which Mr. Spillman holds, that there is a special value to be assigned to life on a farm during early boyhood, but there appears to be certainly no evidence at present to support such a view. Future investigation may show that the farms give a higher ratio than the small towns and villages, but the inference from such data as we have is in favor of concentrated centers of population against sparsely settled regions in general. This idea must stand until special researches show that it does not apply to towns and villages against farms. In any event, the actual farms have probably produced much less than 70 per cent. of the total leaders of the present day, since 30 per cent. are found from the cities alone, and this would leave nothing for the towns and villages.

Mr. Spillman's second letter contains so much that requires discussion or correction that I am forced to quote nearly the entire article, taking the points up one at a time.

Although I thank him for his complimentary references to my study of heredity in royalty, still I am sorry that he has introduced this more complicated discussion just here. But since in the first part of his article he has done so, I would like to correct one or two misinterpretations of my position on the question of environment *versus* heredity. Mr. Spillman says:

I have only one criticism of Dr. Woods's reasoning. In studying heredity in royalty he purposely chose this class because it could be assumed that their characters were formed under the most uniform environment, which purpose was of course entirely legitimate.

This was really not my purpose in choosing royalty as a basis of study; and, furthermore,

I do not think that their characters were formed under a uniform environment. I have found in studying their lives the greatest variation in their environments, all the way from the supposed advantages of a wholesome family life, with famous tutors to give them learning, or the call of warfare to grant opportunity, down to the foul atmosphere of some Bourbon court, or the mouldering walls of a prison cell.

On all this I have dwelt in the same book which Mr. Spillman here alludes to.<sup>1</sup> On page 9 I say:

Although all have the highest social rank, they have lived in different countries, in different centuries, and under varying circumstances, with different educations and opportunities.

The same theme is expressed more fully on page 284, and occurs here and there throughout the whole work.

Mr. Spillman goes on to say:

But it must be remembered that this [royal] environment is the best possible for the development of character and ability.

I do not see how Mr. Spillman can feel justified in making a positive assertion on this point, so many diverse opinions are held. Besides, it is begging the issue which I raise, that no one has shown that any ordinary civilized environment is more influential than any other in molding the rough outlines of character or determining the end product of achievement. I should say that we have no means of knowing whether the royal environment is on the whole favorable or unfavorable. Some investigators like Jacoby and Galippe, along with journalistic writers, have assumed it to be very unfavorable, though without any satisfactory proof.

Mr. Spillman adds:

It would be gratifying to me to see Dr. Woods make a similar study of some class of human beings subjected to an unfavorable environment. I believe he would find, as I have stated above, that even in that class native ability and natural impulses would prove to be purely a matter of

<sup>1</sup> "Mental and Moral Heredity in Royalty," New York, Holt, 1906.

heredity; but that character and actual ability would be found to be profoundly modified by environment. In fact, the whole experience of the human race speaks for this assumption. If the opposite were true, then why should the state go to the expense of maintaining schools, for a man's effectiveness would not depend on his environment but upon his inheritance.

I am glad to answer this point because I think that some of the confusion which ordinarily accompanies the discussion of this time-honored question may be lessened; and I should like at the same time to state my own position in the matter. I have never claimed that great alterations in the environment of man would not produce any results.

It is, at the outset, both necessary and easy to recognize that there are in general two ways that a man may stand in relation to his environment. First, it may be an environment from which he can not escape, try as hard as he may; and second, it may be one from which he can escape, if the inherent tendencies are strong enough. These two arbitrary classes may shade into each other at times; but I think it will aid in clearing up some of the usual perplexity which clings about the subject, if I am permitted to formulate these two categories. An accident which affects the brain or sight, a long term of imprisonment, or confinement to a desert island, may serve as examples of environments from which there is no escape. In a like way the same may be said of the epoch, or period of civilization in which a man's life falls. All such environments must *a priori* modify character more than conditions from which there is a ready, or even possible, escape should the innate impulses crave it. Now the complete cessation of all schools of education would be establishing an environment from which there would be no escape. Except that there would still be libraries, it would be like returning to the educational possibilities at the time of the Teutonic tribes. It would be suddenly changing one period of civilization into another. This would of course work a profound detriment to all mankind. But there would still be marked individual differences of achievement.

Now the point is that in any given age, or in any one civilization, there are always these marked differences of achievement or moral character. The question then arises—Are the differences in environment which have ordinarily existed in the past, within any one age, or do exist at the present time, of sufficient magnitude or force to cause evident or measurable differences among men?

At least within modern centuries, and since the days of serfdom, it is possible for a man to pass from one set of surroundings into another if the inborn desires and abilities are strong enough. Thus here we have a condition coming under the head of an environment of the second class or one from which escape is possible, and therefore we do not expect to find environment working at its maximum, as we do for instance in experimental zoology where the conditions are imposed and unescapable. But more important than this general argument is the fact that no one has shown that such variations in surroundings as occur in the average lives of human beings (riches or poverty, good or bad education, etc.) are in any way responsible for the rougher differences found among men. I say rougher differences because it is only into rough grades and scales of difference that psychic qualities have so far been classified by the few investigators who have worked upon such problems. I suppose that even the ordinary variations in circumstances which befall mankind produce some change in character and achievement. I do not know. All I say is that no one has succeeded in demonstrating it. I myself searched for it in the statistics of royalty by five different methods, but failed to find it there. I concluded that the force of environment is in general slight, in accounting for mental and moral differences, perhaps measurable when more delicate methods should be devised. Galton, from a study of twins,<sup>2</sup> places "nature" over "nurture," though only vaguely so; but Thorndike, in his "Measurements of Twins,"<sup>3</sup> goes fur-

<sup>2</sup> "Inquiries into Human Faculty," 1883.

<sup>3</sup> *Arch. of Philosophy, Psychology and Scientific Methods*, No. 1, September, 1905.

ther than Galton, and precisely confirms my own estimate, made in 1902, of about nine tenths for heredity. Barrington and Pearson have recently found that the influence of environment on sight is *nil*.<sup>4</sup> Thus the prediction is already strongly in favor of future investigators arriving at a similar result, that the ordinary influence of environment on the higher human attributes is at most but trifling when the heredity factor remains the same, or when the heredity factor can be measured, or eliminated from the discussion.

Usually it is not possible to separate heredity from environment. We often merely find some correlation which may be explained as due to either or both of these forces. An example of this sort of correlation is the one I found to exist between general superior achievement in the United States and city birth. I have already explained in my other article why some correlation is to be expected from inheritance alone, while from environment it may or may not be expected. No one is in a position to speak on the latter question because no one knows whether, on the whole, the good and bad sides of city life strike a balance in favor of the city against the good and bad sides of country life. And even if the answer to this complicated problem were known, we should not then know if there were anything efficacious enough to produce a measurable result, as I have explained above.

The failure to find a higher ratio for the cities would have been a serious blow for heredity. The finding of a higher ratio for cities merely wards off a possible attack. It is a purely negative defense, and this is all I have claimed for it. Now, in his second letter Mr. Spillman positively asserts: "Dr. Woods's own figures prove the effect of environment as against heredity." In the light of the explanation in my former letter, which I have here just now, in other words, repeated, I ask, How can he possibly know this? How can he

know that the figures are even beyond the expectation from the heredity factor alone?

Mr. Spillman then complains that the persons listed in "Who's Who in America" do not represent leaders. I do not wish to enter into a discussion on the use of words, and for the sake of the argument will grant that they shall be called merely "competent workers," but I can not refrain from saying in passing that "leaders" seems a very fair word to apply to a group so small as 16,000 out of a total population of some 80,000,000. I should think of the colonel of a regiment of a thousand as the leader of that thousand and it would be in no less just a way and with as good a proportionate sense to call the higher railroad officials, greater bankers and relatively few doctors, lawyers, etc., whose names are included in this same volume "leaders" in their special fields of activity. But even if we are to call them mere "competent workers," are not just such "competent workers" to be desired, whatever be the cause of their competency?

I knew that "Who's Who" itself would be criticized, therefore I forestalled this criticism by the following:

Some will not be willing to accept conclusions drawn from a list which like this doubtless has certain flagrant omissions, and where he sees names that he considers should not have been included. If he will stop for a moment and think, he will see that the very objection he raises only argues in the other direction from what he supposes. If, for instance, I find a marked correlation between city birth and more or less notable subsequent achievement, drawn from an imperfect list, the correlation would be even higher were the list of names ideally perfect.

Mr. Spillman makes no reference to this. The same applies whether the list be lower in standard than it should be owing to errors within itself, or whether it be in general a list showing a low standard of selection. Providing of course that the standard be above the general average of the population, then it follows that the higher the standard the higher would be the correlation, at least as far as mathematical expectation is concerned.

Mr. Spillman then takes a prop from the

<sup>4</sup>"A First Study of the Inheritance of Vision and the Relative Influence of Heredity and Environment on Sight," *Eugenics Laboratory Memoirs*, V., 1909.

25 presidents of the United States "23 of whom were country bred, or were brought up under what the census terms rural conditions." This fact is without significance for two reasons. First, the total 25 is so small that the probable error is necessarily too large to give a conclusion in a statistical discussion of this kind. Second, and equally important, their birth records must be taken in terms of the total proportion of the population dwelling in the country and rural districts in the early days when these men were born. The fact that "about 36 per cent. of our population actually live on the farm at the present time" has nothing to do with the question. The same criticism applies to the figures concerning United States senators. He has shown no ratio over the expected for the rural regions in terms of population distribution, at the time of their birth, some fifty or sixty years ago.

I shall look forward with expectancy to the other statistics which Mr. Spillman hopes to present, and am very glad that he takes an interest in these questions. I agree with him that "the matter must rest here until further statistics are available"; but in the meantime I shall feel much confidence in the indications which have been furnished me as drawn from a list of some sixteen thousand, more or less notable persons, out of the vast population of the United States.

FREDERICK ADAMS WOODS

BROOKLINE, MASS.,

May 17, 1909

#### FAIR PLAY AND TOLERATION IN CRITICISM

To that large number who accept the justice, the value and the need of the recent criticism by Blackwelder of the geological fallacies dressed out as facts in Lowell's book on Mars as the abode of life, some reply will seem called for to offset before the general scientific public the personal, befogging and dogmatic rejoinder which it evoked in a recent issue of *SCIENCE* from one not a geologist.<sup>1</sup> In this connection some preliminary statement may well be made as to the kind of articles

<sup>1</sup>"Fair Play and Toleration in Science," by T. J. J. See, professor of mathematics, U. S. Navy, *SCIENCE*, Vol. XXIX., pp. 858-60, May 28, 1909.

which in the mind of the writer seem to call for certain kinds of criticism. This appears the more necessary since to some all criticism seems out of place and to indicate a carping disposition, while others would hold that specialists are too lax in permitting to pass unchallenged many works which are highly erroneous but whose character is evident to the specialist only.

Destructive criticism is to all constructive workers in science a disagreeable task, yet one which should often be regarded as a duty, especially to university teachers, since such are deeply interested in the general diffusion of knowledge and should be equally concerned in the prevention of that diffusion of error which, unless vigorously combated, takes the place of truth.

All research work, even by properly qualified men, must necessarily contain some percentage of error which is eliminated by further advances in knowledge, but which frequently serves a most valuable purpose in stimulating to further and more exact observation and analysis. Such work, addressed to specialists, is always worthy of more praise than criticism, and a proper review will always seek out the parts of value and give them more prominence than those features which in the mind of the reviewer may seem open to question or even to miss the truth. It is not such research work which is here under discussion.

Advancement of knowledge, however, implies not only abstruse technical researches, but popular expositions of the same which shall carry a vivid conception of the principles and results to the intelligent but unprofessional public, consisting of laymen as well as workers in other branches of knowledge. Such work when well done is regarded by scientists in general as of the very highest educational value, and many eminent men have contributed a part of their time to the development of popular science. In fact, no small part of the eminence of some of the best known and highly regarded men of science is due to their work in what may be called the popular field, since it reaches those whose professional interests are in other branches. It is obvious